



General

Guideline Title

ACR Appropriateness Criteria® imaging of mesenteric ischemia.

Bibliographic Source(s)

Oliva IB, Davarpanah AH, Rybicki FJ, Dill KE, Desjardins B, Flamm SD, Francois CJ, Gerhard-Herman MD, Kalva SP, Mansour MA, Mohler ER III, Schenker MP, Weiss C, Expert Panel on Vascular Imaging. ACR Appropriateness Criteria® imaging of mesenteric ischemia. [online publication]. Reston (VA): American College of Radiology (ACR); 2012. 6 p. [33 references]

Guideline Status

This is the current release of the guideline.

Recommendations

Major Recommendations

ACR Appropriateness Criteria

Clinical Condition: Imaging of Mesenteric Ischemia

Variant 1: Acute mesenteric ischemia.

Radiologic Procedure	Rating	Comments	RRL*
CTA abdomen with contrast	9	Fast noninvasive study that also evaluates other causes of abdominal pain.	<input type="text"/> <input type="text"/> <input type="text"/>
Arteriography abdomen	8	Allows diagnosis and treatment with a single procedure.	<input type="text"/> <input type="text"/> <input type="text"/>
X-ray abdomen	7	Initial study for patients with acute abdominal pain.	<input type="text"/> <input type="text"/>
RRL: 8, 9, 10 Usually appropriate; 7, 5, 6 May be appropriate; 7, 8, 9 Usually appropriate to CT. Limited in distal			Relative

Radiologic Procedure	Rating	Comments	RRL*
		thrombosis/embolism or nonocclusive mesenteric ischemia. See statement regarding contrast in text under "Anticipated Exceptions."	
US abdomen	6	High sensitivity and specificity for venous occlusion, and can assess other causes of abdominal pain.	O
MRA abdomen without contrast	3	Lower sensitivity and specificity than MRA that incorporates contrast.	O
<u>Rating Scale:</u> 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 2: Chronic mesenteric ischemia.

Radiologic Procedure	Rating	Comments	RRL*
CTA abdomen with contrast	9	Fast noninvasive study that also evaluates other causes of abdominal pain.	<input type="text"/> <input type="text"/> <input type="text"/>
Arteriography abdomen	7	Allows diagnosis and treatment with a single procedure.	<input type="text"/> <input type="text"/> <input type="text"/>
US abdomen	7	High sensitivity and specificity for venous occlusion, and can assess other causes of abdominal pain.	O
MRA abdomen without and with contrast	7	Longer when compared to CT. Limited in distal thrombosis/embolism or nonocclusive mesenteric ischemia. See statement regarding contrast in text under "Anticipated Exceptions."	O
X-ray abdomen	3	A normal examination does not exclude chronic mesenteric ischemia.	<input type="text"/> <input type="text"/>
MRA abdomen without contrast	3	Lower sensitivity and specificity than MRA that incorporates contrast.	O
<u>Rating Scale:</u> 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate			*Relative Radiation Level

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Summary of Literature Review

Introduction/Background

Mesenteric ischemia is a rare disease associated with a high mortality rate, especially in the acute setting. This disease is responsible for fewer than one in 1,000 hospital admissions, but its mortality rate ranges between 30% and 90%. It is more prevalent in the elderly population, with comorbidities largely influencing the mortality rate. Another factor associated with the high mortality rate is the clinical presentation with nonspecific symptoms and relatively benign physical examination, which leads to a low index of suspicion and therefore delays in the diagnosis. Most of the data in the incidence of this disease is based on autopsy studies, with the largest epidemiological study conducted in Malmö, Sweden, demonstrating an incidence estimated at 1.2/100,000 person-years between 1970 and 1982. Most cases of mesenteric ischemia are due to an acute event leading to decreased blood supply to the splanchnic vasculature. Chronic mesenteric ischemia is uncommon, accounting for <5% of

cases of mesenteric ischemia, and is almost always associated with diffuse atherosclerotic disease.

Pathophysiology

Acute mesenteric ischemia is most commonly secondary to acute embolism to the superior mesenteric artery (SMA), which accounts for approximately 40% to 50% of all episodes. Acute mesenteric artery thrombosis is the second most common cause of acute mesenteric ischemia (20% to 30%) followed by nonocclusive mesenteric ischemia (25%) and less commonly mesenteric and portal venous thrombosis (5% to 15%). In the chronic setting, mesenteric ischemia is almost always caused by severe atherosclerotic disease, with rare causes including fibromuscular dysplasia, median arcuate ligament syndrome, and vasculitis.

Acute embolization of the SMA involves the distal aspect of the vessel, usually beyond the origin of the middle colic artery, and commonly does not have associated collateral vessels. Acute mesenteric artery thrombosis is typically associated with chronic atherosclerotic disease and, given its more insidious course, a well-developed collateral circulation is commonly present. Nonocclusive mesenteric ischemia is seen in the setting of hypoperfusion because of secondary vasoconstriction of the mesenteric arteries. In these cases, there is no evidence of vascular occlusion, and the ischemia is distributed over a wider area of the bowel in a nonconsecutive manner. Mesenteric and portal venous thrombosis is the least common cause of acute mesenteric ischemia and may be idiopathic. Most common risk factors are hypercoagulable states, portal hypertension, and recent surgery. Bowel ischemia occurs if there is no adequate collateral circulation to drain the intestinal mucosa, leading to edema and subsequent arterial hypoperfusion.

Chronic mesenteric ischemia occurs due to occlusive or stenotic atherosclerotic disease and most commonly involves at least two or three main vessels. It is more prevalent in the elderly population and in patients with major risk factors for atherosclerosis such as hypertension, hyperlipidemia, and smoking history.

Clinical Presentation

Patients with acute mesenteric ischemia present with abdominal pain out of proportion to the physical examination. A high index of suspicion is necessary to achieve early diagnosis. The main challenge is to differentiate acute mesenteric ischemia from other more common causes of acute abdominal pain such as appendicitis, diverticulitis, peptic ulcer disease, acute pancreatitis, gastroenterocolitis, nephrolithiasis, cholelithiasis, and cholecystitis. Early in the course of disease, laboratory findings are of little value in differentiating among these causes, with the results usually demonstrating leukocytosis, hemoconcentration, elevated amylase levels, abnormal liver enzymes, and/or metabolic acidosis.

In the setting of chronic mesenteric ischemia, patients classically present with the clinical triad of postprandial abdominal pain, weight loss, and food avoidance. Nausea and vomiting, postprandial diarrhea, and signs of malabsorption may also be present.

Overview of Imaging Modalities

Conventional angiography has been the reference standard test to assess mesenteric ischemia in both acute and chronic settings, as it allows diagnosis and treatment with a single procedure. Recently with the advances in computed tomography (CT) technique, angiography has become an alternative study. Early angiography remains associated with increased survival rates but has a controversial role in the acute setting when the patient has already developed peritoneal signs, with some authors favoring immediate surgery and others advocating the important role of angiography in the preoperative surgical planning. Nonetheless angiography should not be considered in patients with significant hypovolemia and hypotension, where immediate surgery is the treatment of choice.

Computed tomography angiography (CTA) is a fast and noninvasive test with high sensitivity and specificity in diagnosing acute and chronic mesenteric ischemia and should be considered the first-line test in most acute and chronic cases. CT imaging of the abdomen also allows accurate evaluation of the entire gastrointestinal and genitourinary tract, helping to exclude most of the other causes of acute and chronic abdominal pain, including cholelithiasis, cholecystitis, pancreatitis, appendicitis, diverticulosis with or without diverticulitis, and nephrolithiasis.

Magnetic resonance angiography (MRA) has high sensitivity and specificity for high-grade stenosis and occlusions at the origins of the celiac axis and SMA but has a limited role in evaluating distal arterial stenosis and nonocclusive mesenteric ischemia. Since this is a long test and is not often available promptly, it has a limited role in the acute setting where it may delay treatment. It also has a limited role in the evaluation of the inferior mesenteric artery due to its ability to reveal anatomic characteristics. MR of the abdomen and pelvis without contrast can be used in patients with contraindications for intravenous administration of iodinated and gadolinium contrast, but the lack of opacification of the mesenteric vessels markedly decreases the sensitivity and specificity of this test.

A radiograph is usually the initial test ordered in patients with acute abdominal pain but has a limited role in the diagnosis of mesenteric ischemia, especially in the chronic setting. A negative radiograph does not exclude mesenteric ischemia. Plain radiography only becomes positive late in the course of acute disease when bowel ischemia and infarction have developed. It also has a limited role in assessing for other causes of acute abdominal pain, being only helpful in a few cases of nephrolithiasis and bowel obstruction.

Ultrasound (US) can demonstrate proximal mesenteric vasculature occlusion via Doppler mode with high sensitivity but low specificity and has a limited role in the diagnosis of distal occlusion. US may be helpful in diagnosing other causes of acute abdominal pain such as cholecystitis, cholelithiasis, nephrolithiasis, pancreatitis, and sometimes appendicitis.

Acute Mesenteric Ischemia

Radiographs

Radiography is usually the first imaging modality ordered for patients with acute abdominal pain but has a limited role in demonstrating primary and secondary signs of acute mesenteric ischemia. A normal radiograph does not exclude the diagnosis of acute mesenteric ischemia. Radiography findings in patients with acute mesenteric ischemia are usually nonspecific, late, and associated with a high mortality rate, as they often first appear when bowel infarction has already occurred. A radiograph typically shows bowel dilatation in the elderly patients and a gasless abdomen in younger patients with acute mesenteric ischemia. Hepatic portal venous gas is a rare but important radiographic finding associated with several pathological processes, including bowel necrosis secondary to acute mesenteric ischemia. Hepatic portal venous gas can occur alone or in association with pneumatosis intestinalis. When associated with pneumatosis intestinalis, it usually indicates the presence of advanced mesenteric ischemia. Abdominal CT appears to be superior to radiographs for detecting pneumatosis intestinalis and hepatic portal venous gas, and their underlying cause. Therefore, CT should be used as the primary diagnostic tool rather than radiography.

Computed Tomography Angiography

CTA is a fast and noninvasive diagnostic tool for evaluating bowel and assessing intestinal vasculature. Recently the application of CTA as the ideal first-step imaging approach in patients with acute bowel ischemia has been advocated. CTA can also be helpful in stratifying patients to identify those who would benefit from angiography as opposed to the ones who should undergo emergent surgery. Vascular CT findings include arterial stenosis, embolism, thrombosis, arterial dissection, and mesenteric vein thrombosis; nonvascular CT findings include bowel wall thickening, hypoperfusion and hypoattenuation, bowel dilatation, bowel wall hemorrhage, mesenteric fat stranding, pneumatosis intestinalis, and portal venous gas. Overall, combining vascular findings with the appearance of the bowel wall resulted in a specificity of 94% with a sensitivity of 96%.

Magnetic Resonance Angiography

MRA has high sensitivity and specificity for diagnosing severe stenosis or occlusion at the origins of the celiac axis and SMA. However, it has a limited role in diagnosing distal stenosis as well as nonocclusive mesenteric ischemia, and its use may delay therapeutic options in acute settings because it is a long examination that is not readily available in most practices. MR without contrast has lower sensitivity and specificity but may be used in cases where both iodinated and gadolinium contrast are contraindicated.

Angiography

Angiography has been the gold standard to aid in diagnosis and preoperative planning in acute mesenteric ischemia, with sensitivity in the range of 74% to 100% and specificity of 100%. Early angiography has shown to be associated with increased survival in patients with mesenteric ischemia and allows for initiation of therapeutic maneuvers. Whether angiography should precede surgical intervention in the presence of peritoneal signs is controversial. Some would favor immediate surgery in this setting, as signs of peritonitis usually indicate infarcted bowel. However, others advocate early angiography because of the importance of determining the etiology of bowel ischemia and providing a "roadmap" for revascularization procedures. Nonetheless, angiography should not be considered in patients with significant hypovolemia or hypotension.

Ultrasound

The efficacy of US in diagnosing acute mesenteric ischemia has been evaluated in many studies. US can demonstrate proximal mesenteric vessel thrombosis via Doppler mode. It was shown that US is highly specific for identifying vascular occlusions (92% to 100%) but has a lower sensitivity (70% to 89%). Unfortunately, the presence of extensive gas within the loops of bowel limits the accuracy of this imaging modality. Moreover, duplex US has a limited role in detecting distal arterial emboli or in diagnosing nonocclusive mesenteric ischemia. US might be helpful in excluding other causes of acute abdominal pain such as cholelithiasis, cholecystitis, nephrolithiasis, acute pancreatitis, or even appendicitis, but it is not recommended for initial evaluation of patients with suspected acute mesenteric ischemia because timing of the diagnosis is very critical.

Chronic Mesenteric Ischemia

Radiographs

Radiography has little to no role in the diagnosis of chronic mesenteric ischemia since these patients have not yet developed bowel necrosis, and therefore the radiograph will likely be normal or demonstrate nonspecific findings. A negative radiograph also does not exclude the diagnosis of chronic mesenteric ischemia.

US with B-mode and Doppler waveform analysis is a useful initial screening tool for chronic mesenteric ischemia. Visualizing the mesenteric vessels with duplex US can be technically challenging. The SMA and celiac arteries are visualized in approximately >90% and 80%, respectively. On the other hand, the inferior mesenteric artery can hardly be visualized on transabdominal US studies due to its anatomical location and course. Peak systolic velocity has been widely used for diagnosing stenosis, with a cutoff value of 275 cm/s for the SMA and 200 cm/s for the celiac artery. US can also help in excluding other causes of chronic abdominal pain such as cholelithiasis, nephrolithiasis, and chronic pancreatitis.

Computed Tomography Angiography

CTA with 3-dimensional (3D) volume reformatting has sensitivity and specificity of 96% and 94%, respectively, for detecting chronic mesenteric ischemia. Therefore, it should be considered as a first-line alternative to angiography for diagnostic purposes. Moreover, CTA is an accurate diagnosing tool for detecting SMA syndrome. CT can also accurately exclude other causes of chronic abdominal pain.

Magnetic Resonance Angiography

MRA is a noninvasive test that has become increasingly accurate in recent years for diagnosing chronic mesenteric ischemia, with sensitivity and specificity of 100% and 95%, respectively. Nonetheless, obtaining high-resolution angiograms is still limited to the inferior mesenteric arteries, where it depicts only 25% of this vessel due to its anatomical course. MR without contrast has lower sensitivity and specificity but may be used in cases where both iodinated and gadolinium contrast are contraindicated.

Angiography

Conventional angiography of the mesenteric arteries remains the gold standard for diagnosing chronic bowel ischemia, with its therapeutic role allowing physicians performing endovascular procedures at time of diagnosis. The success rate of angiography is reported to be as high as 88% to 100%, with initial relief of symptoms in 82%–100% of cases. Nevertheless, traditional angiography is an invasive test that exposes patients to radiation and is associated with complications related to the procedure itself.

Summary

- Literature supports conventional angiography as the gold standard test for patients with acute and chronic mesenteric ischemia except for hemodynamically unstable patients with acute mesenteric ischemia.
- CTA is an emerging diagnostic test with high sensitivity and specificity in the setting of both acute and chronic mesenteric ischemia and should be considered the first-line imaging test. CT can also accurately assess for other causes of acute and chronic abdominal pain, and it provides excellent anatomic mapping of the mesenteric vasculature, which is essential in the preoperative planning.
- MRA is an evolving technique with high sensitivity and specificity for severe stenosis or occlusions at the origin of the celiac axis and SMA, but it has a limited role in the evaluation of distal embolism and nonocclusive mesenteric ischemia and is only able to depict 25% of the inferior mesenteric artery. This is also a long test that is not readily available in most centers, making its use even more limited in the acute setting.
- US of the abdomen with Doppler waveform analysis can depict proximal mesenteric thrombosis and secondary signs of bowel compromise, but it is limited in the diagnosis of distal occlusions/stenosis and nonocclusive mesenteric ischemia and therefore is not recommended as the initial examination in evaluating patients with suspected acute mesenteric ischemia.
- Radiographs remain of limited value, being able to diagnosis only late stages of acute mesenteric ischemia when bowel necrosis is already present.

Anticipated Exceptions

Nephrogenic systemic fibrosis (NSF) is a disorder with a scleroderma-like presentation and a spectrum of manifestations that can range from limited clinical sequelae to fatality. It appears to be related to both underlying severe renal dysfunction and the administration of gadolinium-based contrast agents. It has occurred primarily in patients on dialysis, rarely in patients with very limited glomerular filtration rate (GFR) (i.e., <30 mL/min/1.73 m²), and almost never in other patients. There is growing literature regarding NSF. Although some controversy and lack of clarity remain, there is a consensus that it is advisable to avoid all gadolinium-based contrast agents in dialysis-dependent patients unless the possible benefits clearly outweigh the risk, and to limit the type and amount in patients with estimated GFR rates <30 mL/min/1.73 m². For more information, please see the American College of Radiology (ACR) Manual on Contrast Media (see the "Availability of Companion Documents" field).

Abbreviations

- CT, computed tomography
- CTA, computed tomography angiography
- MRA, magnetic resonance angiography
- US, ultrasound

Relative Radiation Level Designations

Relative Radiation Level*	Adult Effective Dose Estimate Range	Pediatric Effective Dose Estimate Range
O	0 mSv	0 mSv
<div></div>	<0.1 mSv	<0.03 mSv
<div><div></div><div></div></div>	0.1-1 mSv	0.03-0.3 mSv
<div><div></div><div></div><div></div></div>	1-10 mSv	0.3-3 mSv
<div><div></div><div></div><div></div><div></div></div>	10-30 mSv	3-10 mSv
<div><div></div><div></div><div></div><div></div><div></div></div>	30-100 mSv	10-30 mSv
*RRL assignments for some of the examinations cannot be made, because the actual patient doses in these procedures vary as a function of a number of factors (e.g., region of the body exposed to ionizing radiation, the imaging guidance that is used). The RRLs for these examinations are designated as "Varies."		

Clinical Algorithm(s)

Algorithms were not developed from criteria guidelines.

Scope

Disease/Condition(s)

- Acute mesenteric ischemia
- Chronic mesenteric ischemia

Guideline Category

Diagnosis

Evaluation

Clinical Specialty

Critical Care

Emergency Medicine

Geriatrics

Internal Medicine

Radiology

Intended Users

Emergency Medical Technicians/Paramedics

Health Plans

Hospitals

Managed Care Organizations

Physicians

Utilization Management

Guideline Objective(s)

To evaluate the appropriateness of radiologic examinations for imaging of mesenteric ischemia

Target Population

Patients with suspected acute or chronic mesenteric ischemia

Interventions and Practices Considered

1. Computed tomography angiography (CTA) abdomen with contrast
2. Arteriography abdomen
3. X-ray abdomen
4. Magnetic resonance angiography (MRA) abdomen
 - Without and with contrast
 - Without contrast
5. Ultrasound (US) abdomen

Major Outcomes Considered

Utility of radiologic examinations in differential diagnosis

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Literature Search Procedure

The Medline literature search is based on keywords provided by the topic author. The two general classes of keywords are those related to the condition (e.g., ankle pain, fever) and those that describe the diagnostic or therapeutic intervention of interest (e.g., mammography, MRI).

The search terms and parameters are manipulated to produce the most relevant, current evidence to address the American College of Radiology Appropriateness Criteria (ACR AC) topic being reviewed or developed. Combining the clinical conditions and diagnostic modalities or therapeutic procedures narrows the search to be relevant to the topic. Exploding the term "diagnostic imaging" captures relevant results for diagnostic topics.

The following criteria/limits are used in the searches.

1. Articles that have abstracts available and are concerned with humans.
2. Restrict the search to the year prior to the last topic update or in some cases the author of the topic may specify which year range to use in the search. For new topics, the year range is restricted to the last 5 years unless the topic author provides other instructions.
3. May restrict the search to Adults only or Pediatrics only.
4. Articles consisting of only summaries or case reports are often excluded from final results.

The search strategy may be revised to improve the output as needed.

Number of Source Documents

The total number of source documents identified as the result of the literature search is not known.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Strength of Evidence Key

Category 1 - The conclusions of the study are valid and strongly supported by study design, analysis and results.

Category 2 - The conclusions of the study are likely valid, but study design does not permit certainty.

Category 3 - The conclusions of the study may be valid but the evidence supporting the conclusions is inconclusive or equivocal.

Category 4 - The conclusions of the study may not be valid because the evidence may not be reliable given the study design or analysis.

Methods Used to Analyze the Evidence

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

The topic author drafts or revises the narrative text summarizing the evidence found in the literature. American College of Radiology (ACR) staff draft an evidence table based on the analysis of the selected literature. These tables rate the strength of the evidence for all articles included in the narrative text.

The expert panel reviews the narrative text, evidence table, and the supporting literature for each of the topic-variant combinations and assigns an appropriateness rating for each procedure listed in the table. Each individual panel member forms his/her own opinion based on his/her interpretation of the available evidence.

More information about the evidence table development process can be found in the ACR Appropriateness Criteria® Evidence Table Development document (see the "Availability of Companion Documents" field).

Methods Used to Formulate the Recommendations

Expert Consensus (Delphi)

Description of Methods Used to Formulate the Recommendations

Modified Delphi Technique

The appropriateness ratings for each of the procedures included in the Appropriateness Criteria topics are determined using a modified Delphi methodology. A series of surveys are conducted to elicit each panelist's expert interpretation of the evidence, based on the available data, regarding the appropriateness of an imaging or therapeutic procedure for a specific clinical scenario. American College of Radiology (ACR) staff distributes surveys to the panelists along with the evidence table and narrative. Each panelist interprets the available evidence and rates each procedure. The surveys are completed by panelists without consulting other panelists. The ratings are a scale between 1 and 9, which is further divided into three categories: 1, 2, or 3 is defined as "usually not appropriate"; 4, 5, or 6 is defined as "may be appropriate"; and 7, 8, or 9 is defined as "usually appropriate." Each panel member assigns one rating for each procedure per survey round. The surveys are collected and the results are tabulated, de-identified and redistributed after each round. A maximum of three rounds are conducted. The modified Delphi technique enables each panelist to express individual interpretations of the evidence and his or her expert opinion without excessive bias from fellow panelists in a simple, standardized and economical process.

Consensus among the panel members must be achieved to determine the final rating for each procedure. Consensus is defined as eighty percent (80%) agreement within a rating category. The final rating is determined by the median of all the ratings once consensus has been reached. Up to three rating rounds are conducted to achieve consensus.

If consensus is not reached, the panel is convened by conference call. The strengths and weaknesses of each imaging procedure that has not reached consensus are discussed and a final rating is proposed. If the panelists on the call agree, the rating is accepted as the panel's consensus. The document is circulated to all the panelists to make the final determination. If consensus cannot be reached on the call or when the document is circulated, "No consensus" appears in the rating column and the reasons for this decision are added to the comment sections.

Rating Scheme for the Strength of the Recommendations

Not applicable

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

Internal Peer Review

Description of Method of Guideline Validation

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Committee on Appropriateness Criteria.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The recommendations are based on analysis of the current literature and expert panel consensus.

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

Selection of appropriate radiologic procedures for imaging of mesenteric ischemia

Potential Harms

Traditional angiography is an invasive test that exposes patients to radiation and is associated with complications related to the procedure itself.

Gadolinium-based Contrast Agents

Nephrogenic systemic fibrosis (NSF) is a disorder with a scleroderma-like presentation and a spectrum of manifestations that can range from limited clinical sequelae to fatality. It appears to be related to both underlying severe renal dysfunction and the administration of gadolinium-based contrast agents. It has occurred primarily in patients on dialysis, rarely in patients with very limited glomerular filtration rate (GFR) (i.e., <30 mL/min/1.73 m²), and almost never in other patients. Although some controversy and lack of clarity remain, there is a consensus that it is advisable to avoid all gadolinium-based contrast agents in dialysis-dependent patients unless the possible benefits clearly outweigh the risk, and to limit the type and amount in patients with estimated GFR rates <30 mL/min/1.73 m². For more information, please see the American College of Radiology (ACR) Manual on Contrast Media (see the "Availability of Companion Documents" field).

Relative Radiation Level (RRL)

Potential adverse health effects associated with radiation exposure are an important factor to consider when selecting the appropriate imaging procedure. Because there is a wide range of radiation exposures associated with different diagnostic procedures, a relative radiation level indication has been included for each imaging examination. The RRLs are based on effective dose, which is a radiation dose quantity that is used to estimate population total radiation risk associated with an imaging procedure. Patients in the pediatric age group are at inherently higher risk from exposure, both because of organ sensitivity and longer life expectancy (relevant to the long latency that appears to accompany radiation exposure). For these reasons, the RRL dose estimate ranges for pediatric examinations are lower as compared to those specified for adults. Additional information regarding radiation dose assessment for imaging examinations can be found in the ACR Appropriateness Criteria® Radiation Dose Assessment Introduction document (see the "Availability of Companion Documents" field).

Qualifying Statements

Qualifying Statements

The American College of Radiology (ACR) Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists, and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those examinations generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the U.S. Food and Drug Administration (FDA) have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.

Implementation of the Guideline

Description of Implementation Strategy

An implementation strategy was not provided.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

Living with Illness

IOM Domain

Effectiveness

Timeliness

Identifying Information and Availability

Bibliographic Source(s)

Oliva IB, Davarpanah AH, Rybicki FJ, Dill KE, Desjardins B, Flamm SD, Francois CJ, Gerhard-Herman MD, Kalva SP, Mansour MA, Mohler ER III, Schenker MP, Weiss C, Expert Panel on Vascular Imaging. ACR Appropriateness Criteria® imaging of mesenteric ischemia. [online publication]. Reston (VA): American College of Radiology (ACR); 2012. 6 p. [33 references]

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2012

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American College of Radiology - Medical Specialty Society

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The American College of Radiology (ACR) provided the funding and the resources for these ACR Appropriateness Criteria®.

Guideline Committee

Committee on Appropriateness Criteria, Expert Panel on Vascular Imaging

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Financial Disclosures/Conflicts of Interest

Not stated

Guideline Status

This is the current release of the guideline.

Guideline Availability

Electronic copies: Available from the [American College of Radiology \(ACR\) Web site](#) .

Print copies: Available from the American College of Radiology, 1891 Preston White Drive, Reston, VA 20191. Telephone: (703) 648-8900.

Availability of Companion Documents

The following are available:

- ACR Appropriateness Criteria®. Overview. Reston (VA): American College of Radiology; 2 p. Electronic copies: Available in Portable Document Format (PDF) from the [American College of Radiology \(ACR\) Web site](#) .
- ACR Appropriateness Criteria®. Literature search process. Reston (VA): American College of Radiology; 1 p. Electronic copies: Available in PDF from the [ACR Web site](#) .
- ACR Appropriateness Criteria®. Evidence table development – diagnostic studies. Reston (VA): American College of Radiology; 2013 Nov. 3 p. Electronic copies: Available in PDF from the [ACR Web site](#) .
- ACR Appropriateness Criteria®. Radiation dose assessment introduction. Reston (VA): American College of Radiology; 2 p. Electronic copies: Available in PDF from the [ACR Web site](#) .
- ACR Appropriateness Criteria®. Manual on contrast media. Reston (VA): American College of Radiology; 92 p. Electronic copies: Available in PDF from the [ACR Web site](#) .
- ACR Appropriateness Criteria®. Procedure information. Reston (VA): American College of Radiology; 1 p. Electronic copies: Available in PDF from the [ACR Web site](#) .
- ACR Appropriateness Criteria® imaging of mesenteric ischemia. Evidence table. Reston (VA): American College of Radiology; 12 p. Electronic copies: Available from the [ACR Web site](#) .

Patient Resources

None available

NGC Status

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